Tom Chatfield Summary

1. INTRODUCTION

Uncritical thinking entails automatically believing what you read or are told without pausing to ask whether it is accurate, true or reasonable. Critical thinking means actively setting out to understand what is really going on, by carefully evalu-ating information, ideas and arguments – and thinking carefully about the process of thinking itself.

Underlying critical thinking are the connected principles of scepticism and objectivity:
• Scepticism entails not automatically accepting that something you hear, read or see should be taken at face value.
• Objectivity means trying to identify the facts of a situation as seen from the outside, rather than relying only on your own – or someone else's – particular feelings or point of view.

There is no such thing as perfect objectivity – you will always bring your experiences and perspec-tive with you – but it is possible to know yourself better, and to practise using tools and techniques for seeing things more clearly. This includes dealing with the difficulties of bias, which comes in two general forms:
• Conscious bias is when someone deliberately presents a very one-sided view of something, or explicitly holds a one-sided opinion about something.
• Unconscious bias is when someone's opinions or decisions are distorted by factors that they are not even aware of.

In particular, it's important to be alert to the problem of confirmation bias: the universal human tendency to use new information only to confirm what you already believe, rather than seeking to improve and clarify your understanding. It's vital to allocate your attention effectively if you want to think critically – and to remember that the first rule of critical engagement is to slow down, and to set aside your first impressions and prejudices.

Critical thinking is best thought of as a set of techniques rather than something you either can or cannot do. Improving your critical thinking means developing and practising a particular set of skills: your toolkit for critical engagement. These tools will help you:
• understand and evaluate reasoning.
• understand and evaluate evidence.
• understand and account for bias.
• develop clear, confident, critical writing.
• become a critically engaged user of technology.

When we think critically, we are searching for the best account we can currently offer of the way things actually are – and this means being obliged to change our minds when facts and reason demand that we do.

2. WHY DOES REASONING MATTER (AND HOW CAN YOU SPOT AN ARGUMENT)?

An assertion is a statement of fact or belief, provided without support or justification.

An argument is an attempt to persuade someone through reasoning that they should agree with a particular conclusion. You can split this into two key elements when identifying arguments:
• Reasoning is being used to…
• …make the case for a particular conclusion.

Arguments are important for critical thinking. By providing reasoning, seeking to justify a particular claim, arguments allow us to work out whether or not we agree with this reasoning – and to com-pare different arguments in order to see which one we find most convincing. When you're trying to work out whether someone is making an argument, it's often best to begin by seeing if you can find a conclusion that they're trying to prove.

It's important to distinguish between arguments and attempts at persuasion without reasoning. Rhetoric is the attempt to persuade by making an emotional appeal rather than by using reasoning. Paying close attention to writing style is important when reading critically: don't be deceived by vagueness, exaggeration or difficulty.

Much of the time, you will also encounter information without persuasion. It's important to be able to identify and evaluate this material separately from arguments. There are four types of information without persuasion:
1. Descriptions simply report information without evaluation or comment.

2. A summary provides a brief outline of key information, often setting out the main points covered in a longer piece of work.
3. An opinion or belief presents someone's point of view without offering reasoning. Opinions tend to be personal judgements based on facts; while beliefs tend to be convictions based on morality, faith or cultural context.
4. A clarification spells out what is meant by a particular phrase, idea or line of thought, while an illustration offers a particular instance of a general point.

Finally, explanations are a special form of reasoning that works backwards from a claim about the world – telling the story of how this thing came to be.

An explanation suggests the reasons that something came to be the way it is. The best explanations are able (1) to explain all the available evidence in (2) as simple a way as possible.

3. HOW DO YOU SPELL OUT THE REASONING BEHIND AN ARGUMENT?

Reconstructing an argument means identifying all its different parts, then setting these out clearly in a standard form that allows us to see exactly how they work.

Standard form means rewriting an argument so that:
• The conclusion is set out clearly at the bottom.
• The reasoning leading to the conclusion is set out clearly above it in the form of numbered premises.

A premise is the most basic building block of an argument. Many different premises can be linked together into a chain of reasoning to support a conclusion.

Extraneous material is information that is not relevant to the argument, and that should be left out as we carefully clarify each premise and conclusion by rewriting them.

An assumption is something relevant to an argument that has been taken for granted by the person presenting it, rather than spelled out.

An extended argument is one in which the final conclusion is supported by one or more premises that are themselves supported by previous premises.

An intermediate conclusion is a conclusion arrived at during the course of an argument; it is then used as a premise for building towards the final conclusion.

The final conclusion comes at the end of an extended argument: it is the final thing that the person making the argument is attempting to persuade you of.

Prejudice means holding a belief without consideration of the evidence for or against it, or deciding in advance of reading an argument what you believe to be the case.

A straw man is an absurd simplification of someone else's position that is obviously wrong or stupid – and that is only expressed so that it can easily be defeated.

The process of reconstruction can be divided into five steps:

1. Apply the principle of charity. This requires us to begin with the assumption that someone else is truthful and reasonable, and to try to reconstruct their argument in its strongest form.
2. Identify the final conclusion (and write it down at the bottom) – conclusion indicator words such as 'because', 'since', 'thus' and 'so' may help us to work out what is going on in an argument by indicating where the final conclusion is. Final conclusions also often appear at either the very start or very end of a piece of writing.
3. Identify the explicit premises (and write them down in order above the final conclusion) – these are all the claims that someone has set out in support of their conclusion.
4. Identify any implicit premises or implicit conclusions (and put them where they are needed) – these are not spelled out by the person stating an argument, but are assumed as part of their reasoning and need to be included in reconstruction.
5. Ensure you know which premises are linked (they need to be taken together to support a con-clusion) and which are independent (they work on their own).

Following this reconstruction, you are ready to evaluate the reasoning on display, paying careful attention to the different types of reasoning in use.

4. HOW DO YOU DRAW OUT A LOGICAL CONCLUSION FROM YOUR PREMISES?

Deductive proof means demonstrating that a particular conclusion logically follows from certain premises, and that this conclusion must be true if these premises are true.

When applying deductive reasoning, you are looking at the structure of an argument and drawing out a logical conclusion that is implicit in your premises.

Logic is the study of the principles distinguishing correct from incorrect reasoning, and its building blocks are the ideas of necessary and sufficient conditions:
• Necessary conditions need to be met in order for something to be true, but they cannot guar-antee its truth. However, if any of the necessary conditions are not met, then something is guaranteed not to be true.
• Sufficient conditions do guarantee the truth of something. If the sufficient conditions for some-thing are met, then it is guaranteed to be true.

We have looked in detail at two general valid forms of deductive reasoning:
• Affirming the antecedent – If A then B. A. So, B.
If it is sunny, I get hot. It is sunny. So I am hot.
• Denying the consequent – If A then B. Not B. So, not A.
If it is sunny, I get hot. I am not hot. So it cannot be sunny.
We have also looked at two fallacious (logically invalid) forms of argument, both of which result from the mistaken assumption that something which is necessarily true is also sufficient to guaran-tee the truth of a conclusion:
• Affirming the antecedent – If A then B. B. So, A.
If it is sunny, I feel happy. I feel happy. So it must be sunny.
• Denying the antecedent – If A then B. Not A. So, not B.
If it is sunny, I feel happy. It is not sunny. So I cannot feel happy.

Overall, we have established that:
• Valid reasoning correctly draws out a logical conclusion from its premises.
• Invalid reasoning means a conclusion does not logically follow from its premises.
• A sound argument is both valid and has true premises, meaning its conclusion must also be true.
• An unsound argument does not meet the standard of soundness, either because it is invalid or because one or more of its premises is untrue, or both. Thus, you cannot rely on its conclusion being true.

5. HOW DO YOU DRAW OUT A PROBABLE CONCLUSION FROM YOUR PREMISES?

When applying inductive reasoning, you are dealing with degrees of certainty rather than absolutes; you are looking for reasons that suggest a conclusion is likely to be true. Inductive reasoning is sometimes known as ampliative reasoning, to spell out the fact that its conclusions are an ‘ampli-fication’ of its premises:
• One important skill is ranking inductive arguments according to how convincing they are.
• In general, good inductive reasoning is based on well-established patterns with consistent supporting evidence, while weaker inductive reasoning results from poor evidence, no clear patterns, or a high degree of unpredictability and complexity.

When talking about how convincing an inductive argument is, we use the idea of inductive strength, also known as inductive force:
• A cogent inductive argument is one that has a good structure, but whose conclusion we should not necessarily accept as true, because we are unsure about the truth of its premises (similar to a valid deductive argument).
• An inductively forceful argument is one that has both a good structure and premises we accept as true, meaning we also have good reasons to accept its conclusion as true (similar to a sound deductive argument, although without its certainty).

Inductive reasoning requires us to spell out the implicit qualifications in a premise: when a general statement is not literally true, we need to indicate whether it applies to a few, most or some cases; or often, sometimes, or infrequently.

Probability is the study of how likely something is to happen or to be true:

• Probability is usually expressed on a scale between zero and one, where a zero probability is entirely impossible and a probability of one is a certainty. A probability of 0.5 is equally likely to happen or not, while values above 0.5 are more likely than not and values below 0.5 are less likely.
• Assessing rational expectation is a key question around inductive arguments. Rational expecta-tion asks: assuming the premises are true, is it more reasonable for you to expect an inductive argument's conclusion to be true or false?

Making use of samples is a vital part of inductive reasoning. A sample consists of the particular cases you are examining in order to make larger generalizations:
• In general, the larger the sample, the better. A sample tends to be expressed in research through the letter n, where n = 1 indicates a sample of one – an anecdote based on a single instance.
• A representative sample is one that closely resembles the larger group it is taken from, while an unrepresentative sample is one that does not. Inductions based on an unrepresentative sample are likely to be distorted compared to reality.
• A successfully randomized sample is one of the best ways of escaping bias in sampling, and means selecting elements of the sample at random from across the entire field of study, with no particular element misleadingly over-represented.
• Because no sample is ever perfectly representative, it's important to be aware of the margin of error (the chance that the result from a survey is the same as in the overall population) and observational error (the accuracy of your measuring system).

The problem of induction describes the fact that, no matter how likely we believe something to be, no inductive argument can ever actually be confirmed – it can only seek refutation and counter-examples:
• Falsification is an important investigative process for inductive reasoning, because a single counter-example can prove that an inductive line of reasoning is false – while no amount of positive instances can ever actually confirm one.
• A black swan is something that defies all previous experience, and the expectations based on that experience, making it almost impossible to predict.

6. HOW CAN YOU SELECT AND TEST THE BEST EXPLANATION OF SOMETHING?

Also known as 'inference to the best explanation', abductive reasoning seeks to establish the best explanation for something believed to be true. The best explanation should:
• Successfully explain all the things that we already know, and • Be as simple as possible while still explaining evidence.

This 'principle of parsimony' is sometimes known as Occam's razor: when choosing between expla-nations, the simplest one that explains everything is likely to be best, while increasing the number of assumptions makes something less likely to be true. Testing abductive explanations involves two kinds of investigation:
• Seeking new evidence that existing explanations cannot account for • Seeking new, simpler explanations that still account for everything.

Discussing abductive reasoning involves explanations, theories and hypotheses:
• An explanation is any account of why something is the way it is.
• A scientific theory explains the underlying nature of a phenomenon in a robust, rigorous and evidence-based manner that is widely accepted by those studying the field.
• A hypothesis provides a specific, testable prediction based on a theory.
• A null hypothesis is the exact opposite of the hypothesis you're testing. Attempting to falsify a null hypothesis ensures a rigorous approach to research.

Moving from evidence to proof requires a rigorous standard of proof – a threshold beyond which you have decided to accept something as proven, and that allows you to specify this standard explicitly:
• Statistical significance describes the likelihood that a particular result could have occurred entirely by chance (as opposed to having a noteworthy cause).
• The p-value is a numerical expression of statistical significance, showing the probability that a result came about through chance on the standard probability scale between zero (impossible) and one (certainty).

A correlation between variables (when one closely follows the other) does not prove causation (mean-ing that one has caused the other). Attempting to successfully demonstrate causation is a central concern of the scientific method, as is being aware of false or misleading sources of correlation.

In general, the less rigorously you are able to scrutinize a theory's predictive power and find a means of testing its claims of causation, the more careful you should be in accepting it as the best working theory available.

Good research across both the 'hard' and social sciences is interested in creating new knowledge or testing existing knowledge, rather than seeking to confirm a pet theory. It is open, transparent and takes place within a community of practice, and aims to:
• Recognize the conditions under which it is possible to meaningfully suggest the presence or the absence of causation
• Recognize the conditions under which it is not appropriate to suggest causation, and in which detailed and suggestive accounts of what is actually going on are the most valuable form of research.

7. HOW SHOULD YOU ASSESS EVIDENCE AND PLAN YOUR READING STRATEGY?

For us to accept someone's reasoning, it must be not only coherent but also connected to the world by firm evidence. All study resources are typically divided into two categories, reflecting their distance from whatever is being investigated: primary and secondary.
• Primary sources derive directly from the place, time or phenomenon under investigation.
• Secondary sources are the product of someone else's work about or around an area of investigation.

When making use of sources, we must investigate whether they are:
• Authentic: authenticity implies that the origin of a source is beyond reasonable doubt: it is what it claims to be; it can be traced from the present to its origins with confidence, ruling out the possibility of fakery, misattribution or alteration.
• Representative: a sample or case study is more representative when it better reflects the complexities of the whole it is being used to represent – and less representative when it does not.
• Relevant: sources are relevant when the evidence they provide is closely related to a claim or line of argument; they are irrelevant if they do not offer any evidence or support.
• Reputable: reputable sources tend to appear in peer-reviewed academic journals, be published by serious publishers, or be produced by known experts in their fields; less reputable sources need to be treated with greater caution.
• Biased or impartial: the more biased a source, the more its author or authors are interested in advancing a particular view of the world; the more impartial a source is, the more it is based on an objective and reasonable assessment.
• Authoritative: an authoritative source is one that you can safely accept as offering a high-quality, expert and accurate view.
• Seminal: seminal works are those that have proved to be central to a particular field or topic, and helped to define its development.
• Current: a current source is one that has not been superseded by new thinking or information, and offers a fair reflection of where things are today.
• Replicated: in general, the more something has been replicated or independently observed elsewhere, the more we can trust it.

Creating a successful reading strategy entails planning, preparation and the effective allocation of intention:

• Make a longlist of as wide a range of potential resources as practicable, based, if possible, on a reading list or multiple reading lists relevant to your field.
• Turn your longlist into a shortlist relating to your current learning objectives, within which you have prioritized the order in which you will read a realistic number of resources.
• Draw on different reading techniques in order to get the most out of your time and resources. This kind of active reading means engaging, questioning, adapting and setting out to see how texts can be most useful to you. Techniques include skim reading, scanning, searching and close reading.
Your note-taking should always provide full details of each source you are using, enabling you to find it again and use it as an academic citation. When taking notes, use the following categories:

• Article details: always begin with these.
• Synopsis: this is a very brief outline of context and overall content.
• Conclusion: what is the main conclusion or intention of the article?
• Reasoning: what reasoning is used to support the conclusion?
• Evidence: what key evidence is used by the author(s)?
• Analysis: how convincing is what you've read, and how useful?
• Follow-up: what questions and investigations are prompted by this source, and what more would it be useful to know or investigate?

• Quotations: are there any particular parts of this source you might want to quote exactly in your future work?

8. HOW CAN YOU THINK CRITICALLY ABOUT LANGUAGE AND RHETORIC?

Language has three common, overlapping uses:
• Communicating information that claims to be objectively true.
• Expressing emotions and attitudes that reveal subjective experience.
• Seeking to cause change in others' behaviour or beliefs.
Hyperbole: deliberate exaggeration for the purpose of rhetorical impact
Litotes: deliberately understating or using a negative to make a point sound convincing while not seeming to claim it directly
Paralepsis: introducing an idea while claiming you do not wish to discuss it, thus allowing you to make a claim while denying any responsibility for discussing it
The last of these categories encompasses the art of rhetoric: persuasion through means other than reasoning. Rhetoric is a complex, emotive art, and learning to recognize and make good use of it is an important aspect of critical thinking. We should remember that:

• Persuasion is not a good thing or a bad thing in itself; it's how it's used that matters.
• Persuasion is an integral part of how we communicate, not an optional extra.

One useful way of thinking about the combination of factors that make a message persuasive dates back to the ancient Greek philosopher Aristotle:
• Ethos establishes the trustworthiness and credentials of the author of a message.
• Logos describes the chain of ideas that the audience is intended to follow.
• Pathos describes the emotional appeal of a message and its delivery.
• Kairos describes the most opportune moment for a message to persuade.

Understanding persuasion means putting it in context and considering the linguistic register within which someone is operating – the type of language appropriate to a particular setting, together with its style and assumptions. Don't simply accept a certain linguistic register as proof of honesty and reliability, or as a definitive sign of unreliability.

In the most persuasive messages, we often find some or all of:
• A compelling human story
• An intensity of emotional appeal
• Elements of mystery and surprise
• The use of memorable or striking language.

Rhetoric also has distinct functions depending on whether it wants us to feel positive or negative towards its subject, something that often plays out in terms of distance:
• When seeking to create positive emotions, rhetoric often brings us closer to a subject emotion-ally, and suggests that we should be open to it.
• When seeking to create negative emotions, rhetoric often makes us feel further away from a subject emotionally, and suggests we should feel closed to it.

Learning to see beyond others' emotive language and achieve impartiality is an important and dif-ficult skill. It entails stripping away emotional bias, as far as possible, and seeking to express things from a neutral perspective. To do this we must:
• Recognize the bias contained in highly emotive language.
• Clearly and accurately express the relevant facts.
• Remain aware of relevant differing beliefs about the significance of these facts.
• Offer some evaluation as to the reasonableness of different beliefs.

Rhetorical devices are persuasive techniques used to enhance the appeal of a message:
• Rhetorical questions are not intended literally and do not require an answer, but have an assumed answer that is used for emphasis.
• Jargon consists of words and phrases likely only to be familiar to experts, sometimes used to confuse or exclude non-experts.
• Buzzwords are fashionable words or phrases used to make something sound impressive, often with little meaning beneath their surface.
• Smokescreens are a kind of verbal concealment, using the discussion of irrelevant points to hide the fact that someone is avoiding a difficult subject.

• Euphemism entails deliberately replacing a phrase with negative connotations, by substituting something neutral or even positive-sounding in its place.
• Hyperbole deliberately exaggerates something for rhetorical effect.
• Litotes deliberately understates or uses a negative to make a point sound more convincing or likely to be accepted.
• Paralepsis introduces an idea while claiming it's not your intention to discuss it, allowing you to make suggestions without taking any responsibility for them.

9. HOW CAN YOU THINK CRITICALLY ABOUT FALLACIES AND FAULTY REASONING?

A fallacy is a recognisable general type of faulty reasoning. Effectively engaging with a fallacious argument means identifying its unwarranted hidden assumption. If necessary, a comparable example can help both to clarify whether an argument is fallacious and to illustrate persuasively why it is flawed.

Fallacious arguments cannot guarantee the truth of their conclusions, but they are not the same thing as arguments with false premises:
• An argument is not necessarily fallacious when it is based on a false premise or when it has a false conclusion.
• A fallacious argument can still have true premises.
• A fallacious argument can still have a true conclusion.

There are two broad categories of fallacies:
• Informal fallacies are faulty or flawed forms of reasoning that relate to the content of premises, and must be determined with reference to external information.
• Formal fallacies are logically invalid forms of argument, and the fault in their reasoning can be determined purely by reference to logical structure.

Three general types of informal fallacy are:
• Fallacies of relevance (red herrings): these rely on premises that are either irrelevant or not suf-ficiently relevant to reasonably support a conclusion.
• Fallacies of ambiguity (linguistic fallacies): these occur when the meanings of words or con-cepts are twisted during the course of reasoning, or uncertainty and ambiguity are used to support an unjustified conclusion.
• Material fallacies (fallacies of presumption): these have premises that assume too much and that represent some of the most common techniques of poor reasoning, even when they are not necessarily fallacious.

Four common formal fallacies are:
• Affirming the consequent: this is based on the mistaken assumption that, if B will necessarily be true when A is true, then observing B is sufficient to prove that A is also the case: 'If you love me, you'll reply to my email. You replied to my email, so you must love me.' It has the general form: 'If A, then B. B. Therefore, A.'
• Denying the antecedent: this is based on the mistaken assumption that, if B will necessarily be true when A is true, then observing that A is not the case must also mean that B is not the case: 'If you order steak, you'll enjoy your meal. You didn't order steak. So you cannot enjoy your meal.' It has the general form: 'If A, then B. Not A. Therefore, not B.'
• The undistributed middle: this is based on the unwarranted assumption that knowing X about members of a category is the same as knowing that X applies only to members of that cat-egory. For example: 'All magicians have beards. My friend has a beard. So he must be a magician!' Even if it is true that 'all magicians have beards', this is not at all the same thing as saying that 'only magicians have beards'. In general, the fallacy takes the form: 'All As are B. C is B. Thus, C is also A.'
• Base rate neglect: this is based on the logical-seeming claim that, if most As are C and few Bs are C, then any randomly picked C is more likely to be an A than a B. Why is this fallacious? Because until we know how big category A is, relative to category B, we cannot in fact say anything about how likely a randomly picked case is to belong to either group. For example: 'Most diplomats are bilingual. Few ordinary Londoners are bilingual. If I meet someone bilingual in London, they're likely to be a diplomat.' This is a fallacious argument, because it neglects the fact that there are very few diplomats in London relative to the overall population.

10. HOW CAN YOU THINK CRITICALLY ABOUT COGNITIVE AND BEHAVIOURAL BIAS?

Careful, conscious scrutiny is a time-consuming and resource-intensive process, and so humans have evolved to rely on a large number of largely unconscious, instinctual and emotive approaches to making rapid yet broadly accurate judgements.
We call the cognitive short cuts that allow quick decision-making and judgement heuristics. They usually involve replacing a complex question with something amenable to a quick, simple solution.

Four types of heuristic are of particular interest and feature prominently in the literature of Behavioural Economics – a young field that uses the methods and insights of psychology to investi-gate real-life decision-making behaviours, based on experimental observation:
• The affect heuristic describes a tendency to use the strength of positive or negative emotional reactions as a decision-making short cut.
• The availability heuristic describes a tendency to be disproportionately influenced by whatever most easily or vividly comes to mind when making a decision or assessing options.
• The anchoring effect describes our reliance on an initial value or frame of reference in reaching a judgement, even when it is of no relevance to the question we are being asked to judge.
• The representativeness heuristic describes a tendency to be influenced by the plausibility of a story or characterization, at the expense of assessing its likelihood.

Becoming more aware of the heuristics that everyday thinking relies on can help us base our investigations of human experience on a realistic assessment of how judgements are reached. This awareness can also help us be alert to – and put strategies in place to resist – both deliberate manipulations and accidental sources of error.

Most of the time, heuristics are effective and reliable in everyday situations, especially when they involve dealing with people we know and situations of which we have plenty of experience.

When they result in an incorrect judgement, however, this is an example of cognitive bias – a predictable distortion of judgement or thought. Significant cognitive biases include:

• Framing effects: presenting the same scenario in different ways can affect judgement and alter preference, based on perceptions of loss and gain, positive and negative.
• Re-framing: deliberately selecting a different way of presenting information in order to challenge the emphasis created by a particular initial framing.
• Loss aversion: the observation that losses are more painful than equivalent gains are perceived as beneficial, and that people thus tend to be biased towards loss avoidance.
• Confirmation bias: the tendency to pay attention only to things that confirm our pre-existing ideas, and to ignore or seek to explain away evidence that contradicts them.
• Sharpshooter fallacy/clustering illusion: the tendency to see a pattern where none exists, by imposing it after the event on evidence while ignoring whatever doesn't fit.
• Just world hypothesis: the belief that everything balances out in the end and that the world is fundamentally arranged in a way that is fair.
• Coherence effect: the tendency to judge information not by its accuracy or likelihood, but by how internally coherent a story or worldview it embodies.
• Dunning-Kruger effect: the tendency of people with little ability in an area to greatly over-estimate their skill, meaning ignorance breeds unwarranted confidence.
• Overconfidence effect: the tendency of most people – and especially experts outside their domain of expertise – to have excessive faith in their judgements and abilities.

11. HOW CAN YOU BEST OVERCOME BIAS IN YOURSELF AND OTHERS?

What do you need to know in order to distrust your intuitions effectively? Watch out for three types of misclassification:

• We wrongly assume that something that happened by chance is significant.
•We overlook the significance of those things that did not happen.
•We assume that things are more regular and predictable than they actually are.

First, attaching excessive significance to random events:
• The law of small numbers suggests that, the smaller a sample or the fewer times something is measured, the more likely its results are to differ from the expected outcome. By contrast, the law of large numbers suggests that, the larger a sample or the more often a consistent measure is repeated, the more likely its results are to tend towards the expected outcome.
• Reversion to the mean describes the fact that an exceptional result is most likely to be fol-lowed by a less exceptional result, and an outstanding performance by a less outstanding performance.
• The fundamental attribution error is a tendency to disproportionately view events as the result of deliberate actions and intentions, rather than as a product of circumstances.
• Moral luck describes the paradox that we ought only to blame people for things they control, and yet in practice we often judge them by the result of fortunate or unfortunate events that lie beyond their control.

Second, failing to consider things that didn't happen:
• Outcome bias describes a tendency to assess the quality of a decision by looking only at its result, rather than by considering whether it made sense at the time.
• Survivorship bias describes a tendency only to pay attention to survivors and success stories, creating a distorted picture that ignores failures.
• In order to avoid falling into the traps above, we need to consider alternative histories: the range of different possibilities that exist at a particular moment in time, together with their likelihood. Over time, alternative histories will 'catch up' with those following an unwise decision-making strategy.
• Hindsight bias is a tendency to see the past, in retrospect, as more predictable than it actually was, and to treat unforeseen events as though they were foreseeable
• In academia, publication bias describes the temptation for journals to publish research with positive or striking outcomes in preference to other, equally valid research that demonstrates a lack of significance or causation.
• Cherry-picking in research means deliberately selecting a few striking results or strong effects from within a larger piece of research while suppressing the rest, thus misrepresenting the strength of the effects under investigation.

Third, over-estimating regularity and predictability:
• We need to be alert to the impact of extremes: the fact that just one extreme event, even if rare, can have a more significant impact than any number of ordinary events.
• We need to beware the illusion of predictability: the belief that an observed pattern will necessarily be repeated, or that current notions of normality will always apply.

Finally, we need to be aware of where our abilities and vulnerabilities lie:
• We are very well adapted, in general, to assessing small-scale social situations rapidly and accurately, so long as we know the conventions governing them.
• We are relatively poorly adapted, in general, to assessing large-scale, complex problems involving statistics, and are often misled by intuition when facing them.

12. HOW CAN YOU BE A MORE CRITICALLY ENGAGED USER OF TECHNOLOGY?

In a digital age, there is a tension between what it means to acquire, debate and disseminate knowl-edge and to interact constantly with and through information systems.
• Acquiring, debating and disseminating knowledge tends: to be slow and effortful, to prioritize truth and accuracy, to persuade primarily through reasoning, and to actively invite debate and dissent.
• Interacting constantly through shared information systems can put an emphasis on speed and ease, on emotional and social impact, on popularity rather than truth, and on confirmation- and consensus.

Given that elements of both of these tendencies are present in most uses of technology, an impor-tant underlying question is:
• How effectively are we able to pursue knowledge while also interacting through shared, sociable information systems, and benefiting from their opportunities?

To think precisely about this process, it is useful to make a distinction between data, information and knowledge:

• Raw data is figures or facts, awaiting organization.
• Information is data that has been structured, processed, arranged or placed in a particular context in order to make it meaningful.
• Verification entails performing a reliable process in order to investigate the accuracy and rel- iability of information.
• Knowledge is information that has been verified, and that we thus have good reason to believe describes the way things actually are.
• Transparency entails honesty and clearly showing your process of verification and acknow- ledging its limitations.
• Authority describes the claim, based on its source, that one particular account of the way things are has primacy over others.

More information does not automatically create more knowledge. In fact, it creates considerable challenges when it comes to creating knowledge and understanding. Particular vulnerabilities and biases to be alert to in information environments include:

• The power of social proof and its conflation of authority with popularity.

• An emphasis on impact over insight, and on quantity over quality.
• The prevalence of echo chambers, network effects, filter bubbles and polarization, together with the tyranny of the minority.
• Recency bias, together with an emphasis on speed and freshness as proxies for significance and merit.

All of these challenges are connected to time and attention, and to our reliance on cognitive heuristics- (mental short cuts) when called on to make decisions constantly and rapidly within an environment where we are continually exposed to others' opinions.

When conducting any investigation, we need to account for four different general types of know- ledge and ignorance, and to do so by deploying both an effective search strategy (finding something specific that we know we are looking for) and a discovery strategy (discovering what it is we ought to be looking for):
• Identified knowledge ('known knowns'): those things we know that we know and that are typi-cally just one click or careful search term away online.
• Identified ignorance ('known unknowns'): those things we know that we do not know, and are thus explicitly setting out to investigate or discover.
• Unidentified knowledge ('unknown knowns'): those things that are known but have not been identified as a source of knowledge by us.
• Unidentified ignorance ('unknown unknowns'): those things we now know we do not know and will thus find out about belatedly, if at all.

Gaining knowledge within this last category of 'unknown unknowns' is difficult and demands the deliberate cultivation of a diversity of sources, an open planning period, continued exposure to serendipitous information, and remaining open-minded, flexible and resistant to prevailing opinion.

13. HOW CAN YOU BECOME A CRITICALLY ENGAGED WRITER AND THINKER?

Good writing begins with good reading: reading widely, passionately and actively. Write notes, plan your strategy and start filling the page and the screen sooner rather than later. All good writing is also rewriting. Learn to read your own work closely, with a critical eye. When writing in an academic context, follow these steps:
• Ensure you understand what is being asked of you.
• Plan your reading, conduct your research and gather information.
• Structure your content and draw up an outline.
• Come up with a good introduction.
• Write the main body of your work in a logical sequence.
• Write a conclusion that clearly answers the question you began with.
• Finish your first draft and set aside the time to revise it.
• Don't forget to provide references and a bibliography.
• Embrace feedback and conversations. Learn and improve.

When it comes to getting the work done, ask yourself:
• What holds me back psychologically from writing and engaging?
• What are the most significant practical obstacles to working in the way I would like to work, and achieving what I would like to achieve?
• What is my strategy for overcoming these obstacles?

1. INTRODUCTION

Uncritical thinking entails automatically believing what you read or are told without pausing to ask whether it is accurate, true or reasonable.

Critical thinking means actively setting out to understand what is really going on, by carefully evalu-ating information, ideas and arguments – and thinking carefully about the process of thinking itself.

Underlying critical thinking are the connected principles of scepticism and objectivity:

- **Scepticism** entails not automatically accepting that something you hear, read or see should be taken at face value.
- **Objectivity** means trying to identify the facts of a situation as seen from the outside, rather than relying only on your own – or someone else's – particular feelings or point of view.

There is no such thing as perfect objectivity – you will always bring your experiences and perspec-tive with you – but it is possible to know yourself better, and to practise using tools and techniques for seeing things more clearly. This includes dealing with the difficulties of **bias**, which comes in two general forms:

- **Conscious bias** is when someone deliberately presents a very one-sided view of something, or explicitly holds a one-sided opinion about something.
- **Unconscious bias** is when someone's opinions or decisions are distorted by factors that they are not even aware of.

In particular, it's important to be alert to the problem of **confirmation bias**: the universal human tendency to use new information only to confirm what you already believe, rather than seeking to improve and clarify your understanding.

It's vital to **allocate your attention** effectively if you want to think critically – and to remember that the first rule of critical engagement is to **slow down**, and to set aside your first impressions and prejudices.

Critical thinking is best thought of as a set of techniques rather than something you either can or cannot do. Improving your critical thinking means developing and practising a particular set of skills: your **toolkit** for critical engagement. These tools will help you:

- understand and evaluate reasoning.
- understand and evaluate evidence.
- understand and account for bias.
- develop clear, confident, critical writing.
- become a critically engaged user of technology.

When we think critically, we are searching for the **best account** we can currently offer of the way things actually are – and this means being obliged to change our minds when facts and reason demand that we do.

2. WHY DOES REASONING MATTER (AND HOW CAN YOU SPOT AN ARGUMENT)?

An **assertion** is a statement of fact or belief, provided without support or justification.

An **argument** is an attempt to persuade someone through reasoning that they should agree with a particular conclusion. You can split this into two key elements when identifying arguments:

- **Reasoning** is being used to…
- …make the case for a particular **conclusion**.

Arguments are important for critical thinking. By providing reasoning, seeking to justify a particular claim, arguments allow us to work out whether or not we agree with this reasoning – and to com-pare different arguments in order to see which one we find most convincing.

When you're trying to work out whether someone is making an argument, it's often best to begin by seeing if you can **find a conclusion** that they're trying to prove.

It's important to distinguish between arguments and attempts at **persuasion without reasoning**. **Rhetoric** is the attempt to persuade by making an emotional appeal rather than by using reasoning. Paying close attention to writing **style** is important when reading critically: don't be deceived by vagueness, exaggeration or difficulty.

Much of the time, you will also encounter **information without persuasion**. It's important to be able to identify and evaluate this material separately from arguments. There are four types of information without persuasion:

1 **Descriptions** simply report information without evaluation or comment.

2 A **summary** provides a brief outline of key information, often setting out the main points covered in a longer piece of work.

3 An opinion or belief presents someone's point of view without offering reasoning. **Opinions** tend to be personal judgements based on facts; while **beliefs** tend to be convictions based on morality, faith or cultural context.

4 A **clarification** spells out what is meant by a particular phrase, idea or line of thought, while an **illustration** offers a particular instance of a general point.

Finally, **explanations** are a special form of reasoning that works backwards from a claim about the world – telling the story of how this thing came to be.

An explanation suggests the reasons that something came to be the way it is. The **best explanations** are able (1) to explain all the available evidence in (2) as simple a way as possible.

3. HOW DO YOU SPELL OUT THE REASONING BEHIND AN ARGUMENT?

Reconstructing an argument means identifying all its different parts, then setting these out clearly in a standard form that allows us to see exactly how they work.

Standard form means rewriting an argument so that:

- The **conclusion** is set out clearly at the bottom.

- The reasoning leading to the conclusion is set out clearly above it in the form of numbered premises.

A **premise** is the most basic building block of an argument. Many different premises can be linked together into a chain of reasoning to support a conclusion.

Extraneous material is information that is not relevant to the argument, and that should be left out as we carefully **clarify** each premise and conclusion by rewriting them.

An **assumption** is something relevant to an argument that has been taken for granted by the person presenting it, rather than spelled out.

An **extended argument** is one in which the final conclusion is supported by one or more premises that are themselves supported by previous premises.

An **intermediate conclusion** is a conclusion arrived at during the course of an argument; it is then used as a premise for building towards the final conclusion.

The **final conclusion** comes at the end of an extended argument: it is the final thing that the person making the argument is attempting to persuade you of.

Prejudice means holding a belief without consideration of the evidence for or against it, or deciding in advance of reading an argument what you believe to be the case.

A **straw man** is an absurd simplification of someone else's position that is obviously wrong or stupid – and that is only expressed so that it can easily be defeated.

The **process of reconstruction** can be divided into five steps:

1 Apply the **principle of charity**. This requires us to begin with the assumption that someone else is truthful and reasonable, and to try to reconstruct their argument in its strongest form.
2. Identify the **final conclusion** (and write it down at the bottom) – conclusion indicator words such as 'because', 'since', 'thus' and 'so' may help us to work out what is going on in an argument by indicating where the final conclusion is. Final conclusions also often appear at either the very start or very end of a piece of writing.
3 Identify the **explicit premises** (and write them down in order above the final conclusion) – these are all the claims that someone has set out in support of their conclusion.
4 Identify any **implicit premises** or **implicit conclusions** (and put them where they are needed) – these are not spelled out by the person stating an argument, but are **assumed** as part of their reasoning and need to be included in reconstruction.
5 Ensure you know which premises are **linked** (they need to be taken together to support a con-clusion) and which are **independent** (they work on their own).

Following this reconstruction, you are ready to **evaluate** the reasoning on display, paying careful attention to the different types of reasoning in use.

4. HOW DO YOU DRAW OUT A LOGICAL CONCLUSION FROM YOUR PREMISES?

Deductive proof means demonstrating that a particular conclusion logically follows from certain premises, and that this conclusion must be true if these premises are true.

When applying **deductive reasoning**, you are looking at the structure of an argument and drawing out a logical conclusion that is implicit in your premises.

Logic is the study of the principles distinguishing correct from incorrect reasoning, and its building blocks are the ideas of necessary and sufficient conditions:

•• **Necessary** conditions need to be met in order for something to be true, but they cannot guar-antee its truth. However, if any of the necessary conditions are not met, then something is guaranteed not to be true.

•• **Sufficient** conditions do guarantee the truth of something. If the sufficient conditions for some-thing are met, then it is guaranteed to be true.

We have looked in detail at **two general valid forms** of deductive reasoning:

•• Affirming the antecedent – If A then B. A. So, B.

If it is sunny, I get hot. It is sunny. So I am hot.

•• Denying the consequent – If A then B. Not B. So, not A.

If it is sunny, I get hot. I am not hot. So it cannot be sunny.

We have also looked at **two fallacious (logically invalid) forms** of argument, both of which result from the mistaken assumption that something which is necessarily true is also sufficient to guaran-tee the truth of a conclusion:

•• Affirming the antecedent – If A then B. B. So, A.

If it is sunny, I feel happy. I feel happy. So it must be sunny.

•• Denying the antecedent – If A then B. Not A. So, not B.

If it is sunny, I feel happy. It is not sunny. So I cannot feel happy.

Overall, we have established that:

- **Valid reasoning** correctly draws out a logical conclusion from its premises.
- **Invalid reasoning** means a conclusion does not logically follow from its premises.
- A **sound argument** is both valid and has true premises, meaning its conclusion must also be true.
- An **unsound** argument does not meet the standard of soundness, either because it is invalid or because one or more of its premises is untrue, or both. Thus, you cannot rely on its conclusion being true.

5. HOW DO YOU DRAW OUT A PROBABLE CONCLUSION FROM YOUR PREMISES

When applying **inductive reasoning**, you are dealing with degrees of certainty rather than absolutes; you are looking for reasons that suggest a conclusion is likely to be true. Inductive reasoning is sometimes known as **ampliative reasoning**, to spell out the fact that its conclusions are an 'ampli-fication' of its premises:

•• One important skill is **ranking** inductive arguments according to how convincing they are.

•• In general, good inductive reasoning is based on well-established patterns with consistent supporting evidence, while weaker inductive reasoning results from poor evidence, no clear patterns, or a high degree of unpredictability and complexity.

When talking about how convincing an inductive argument is, we use the idea of **inductive strength**, also known as **inductive force**:

•• A **cogent** inductive argument is one that has a good structure, but whose conclusion we should not necessarily accept as true, because we are unsure about the truth of its premises (similar to a valid deductive argument).

•• An **inductively forceful** argument is one that has both a good structure and premises we accept as true, meaning we also have good reasons to accept its conclusion as true (similar to a sound deductive argument, although without its certainty).

Inductive reasoning requires us to spell out the **implicit qualifications** in a premise: when a general statement is not literally true, we need to indicate whether it applies to a few, most or some cases; or often, sometimes, or infrequently.

Probability is the study of how likely something is to happen or to be true:

•• Probability is usually expressed on a scale between zero and one, where a zero probability is entirely impossible and a probability of one is a certainty. A probability of 0.5 is equally likely to happen or not, while values above 0.5 are more likely than not and values below 0.5 are less likely.

•• Assessing **rational expectation** is a key question around inductive arguments. Rational expecta-tion asks: assuming the premises are true, is it more reasonable for you to expect an inductive argument's conclusion to be true or false?

Making use of **samples** is a vital part of inductive reasoning. A sample consists of the particular cases you are examining in order to make larger generalizations:

•• In general, the larger the sample, the better. A sample tends to be expressed in research through the letter **n**, where **n = 1** indicates a sample of one – an anecdote based on a single instance.

•• A **representative sample** is one that closely resembles the larger group it is taken from, while an **unrepresentative sample** is one that does not. Inductions based on an unrepresentative sample are likely to be distorted compared to reality.

•• A successfully **randomized sample** is one of the best ways of escaping bias in sampling, and means selecting elements of the sample at random from across the entire field of study, with no particular element misleadingly over-represented.

•• Because no sample is ever perfectly representative, it's important to be aware of the **margin of error** (the chance that the result from a survey is the same as in the overall population) and **observational error** (the accuracy of your measuring system).

The **problem of induction** describes the fact that, no matter how likely we believe something to be, no inductive argument can ever actually be **confirmed** – it can only seek **refutation** and **counter-examples**:

- **Falsification** is an important investigative process for inductive reasoning, because a single **counter-example** can prove that an inductive line of reasoning is false – while no amount of positive instances can ever actually confirm one.

- A **black swan** is something that defies all previous experience, and the expectations based on that experience, making it almost impossible to predict.

6. HOW CAN YOU SELECT AND TEST THE BEST EXPLANATION OF SOMETHING

Also known as 'inference to the best explanation', **abductive reasoning** seeks to establish the best explanation for something believed to be true. The **best explanation** should:

•• Successfully explain all the things that we already know, and •• Be as simple as possible while still explaining evidence.

This 'principle of parsimony' is sometimes known as **Occam's razor**: when choosing between explanations, the simplest one that explains everything is likely to be best, while increasing the number of assumptions makes something less likely to be true. Testing abductive explanations involves two kinds of investigation:

•• Seeking new evidence that existing explanations cannot account for •• Seeking new, simpler explanations that still account for everything.

Discussing abductive reasoning involves explanations, theories and hypotheses:

•• An **explanation** is any account of why something is the way it is.

•• A scientific **theory** explains the underlying nature of a phenomenon in a robust, rigorous and evidence-based manner that is widely accepted by those studying the field.

•• A **hypothesis** provides a specific, testable **prediction** based on a theory.

•• A **null hypothesis** is the exact opposite of the hypothesis you're testing. Attempting to falsify a null hypothesis ensures a rigorous approach to research.

Moving from evidence to proof requires a rigorous **standard of proof** – a threshold beyond which you have decided to accept something as proven, and that allows you to specify this standard explicitly:

•• **Statistical significance** describes the likelihood that a particular result could have occurred entirely by chance (as opposed to having a noteworthy cause).

- The **p-value** is a numerical expression of statistical significance, showing the probability that a result came about through chance on the standard probability scale between zero (impossible) and one (certainty).

A **correlation** between variables (when one closely follows the other) does not prove **causation** (mean-ing that one has caused the other). Attempting to successfully demonstrate causation is a central concern of the **scientific method**, as is being aware of false or misleading sources of correlation.

In general, the less rigorously you are able to scrutinize a theory's predictive power and find a means of testing its claims of causation, the more careful you should be in accepting it as the best working theory available.

Good research across both the 'hard' and social sciences is interested in creating new knowledge or testing existing knowledge, rather than seeking to confirm a pet theory. It is open, transparent and takes place within a community of practice, and aims to:

- Recognize the conditions under which it is possible to meaningfully suggest the presence or the absence of causation
- Recognize the conditions under which it is not appropriate to suggest causation, and in which detailed and suggestive accounts of what is actually going on are the most valuable form of research.

7. HOW SHOULD YOU ASSESS EVIDENCE AND PLAN YOUR READING STRATEGY

For us to accept someone's reasoning, it must be not only coherent but also connected to the world by firm **evidence**. All study resources are typically divided into two categories, reflecting their distance from whatever is being investigated: primary and secondary.

- **Primary sources** derive directly from the place, time or phenomenon under investigation.
- **Secondary sources** are the product of someone else's work about or around an area of investigation.

When making use of sources, we must investigate whether they are:

- **Authentic**: authenticity implies that the origin of a source is beyond reasonable doubt: it is what it claims to be; it can be traced from the present to its origins with confidence, ruling out the possibility of fakery, misattribution or alteration.
- **Representative**: a sample or case study is more representative when it better reflects the complexities of the whole it is being used to represent – and less representative when it does not.
- **Relevant**: sources are relevant when the evidence they provide is closely related to a claim or line of argument; they are **irrelevant** if they do not offer any evidence or support.
- **Reputable**: reputable sources tend to appear in peer-reviewed academic journals, be published by serious publishers, or be produced by known experts in their fields; less reputable sources need to be treated with greater caution.
- **Biased** or **impartial**: the more biased a source, the more its author or authors are interested in advancing a particular view of the world; the more impartial a source is, the more it is based on an objective and reasonable assessment.
- **Authoritative**: an authoritative source is one that you can safely accept as offering a high-quality, expert and accurate view.
- **Seminal**: seminal works are those that have proved to be central to a particular field or topic, and helped to define its development.
- **Current**: a current source is one that has not been superseded by new thinking or information, and offers a fair reflection of where things are today.
- **Replicated**: in general, the more something has been replicated or independently observed elsewhere, the more we can trust it.

Creating a successful **reading strategy** entails planning, preparation and the effective allocation of intention:

- Make a **longlist** of as wide a range of potential resources as practicable, based, if possible, on a reading list or multiple reading lists relevant to your field.
- Turn your longlist into a **shortlist** relating to your current learning objectives, within which you have prioritized the order in which you will read a realistic number of resources.
- Draw on different **reading techniques** in order to get the most out of your time and resources. This kind of **active reading** means engaging, questioning, adapting and setting out to see how texts can be most useful to you. Techniques include **skim reading**, **scanning**, **searching** and **close reading**.

Your note-taking should always provide **full details** of each source you are using, enabling you to find it again and use it as an academic **citation**. When taking notes, use the following categories:

- **Article details**: always begin with these.
- **Synopsis**: this is a very brief outline of context and overall content.
- **Conclusion**: what is the main conclusion or intention of the article?
- **Reasoning**: what reasoning is used to support the conclusion?
- **Evidence**: what key evidence is used by the author(s)?
- **Analysis**: how convincing is what you've read, and how useful?
- **Follow-up**: what questions and investigations are prompted by this source, and what more would it be useful to know or investigate?
- **Quotations**: are there any particular parts of this source you might want to quote exactly in your future work?

8. HOW CAN YOU THINK CRITICALLY ABOUT LANGUAGE AND RHETORIC

Language has three common, overlapping uses:

•• **Communicating information** that claims to be objectively true.

•• **Expressing emotions** and attitudes that reveal subjective experience.

•• **Seeking to cause change** in others' behaviour or beliefs.

Hyperbole: deliberate exaggeration for the purpose of rhetorical impact

Litotes: deliberately understating or using a negative to make a point sound convincing while not seeming to claim it directly

Paralepsis: introducing an idea while claiming you do not wish to discuss it, thus allowing you to make a claim while denying any responsibility for discussing it

The last of these categories encompasses the art of **rhetoric**: persuasion through means other than reasoning. Rhetoric is a complex, emotive art, and learning to recognize and make good use of it is an important aspect of critical thinking. We should remember that:

•• Persuasion is not a good thing or a bad thing in itself; it's how it's used that matters.

•• Persuasion is an integral part of how we communicate, not an optional extra.

One useful way of thinking about the combination of factors that make a message persuasive dates back to the ancient Greek philosopher Aristotle:

•• **Ethos** establishes the trustworthiness and credentials of the author of a message.

•• **Logos** describes the chain of ideas that the audience is intended to follow.

•• **Pathos** describes the emotional appeal of a message and its delivery.

•• **Kairos** describes the most opportune moment for a message to persuade.

Understanding persuasion means putting it in context and considering the **linguistic register** within which someone is operating – the type of language appropriate to a particular setting, together with its style and assumptions. Don't simply accept a certain linguistic register as proof of honesty and reliability, or as a definitive sign of unreliability.

In the most persuasive messages, we often find some or all of:

•• A compelling human story

- An intensity of emotional appeal
- Elements of mystery and surprise
- The use of memorable or striking language.

Rhetoric also has distinct functions depending on whether it wants us to feel positive or negative towards its subject, something that often plays out in terms of distance:

- When seeking to create positive emotions, rhetoric often brings us **closer** to a subject emotion-ally, and suggests that we should be **open** to it.
- When seeking to create negative emotions, rhetoric often makes us feel **further away** from a subject emotionally, and suggests we should feel **closed** to it.

Learning to see beyond others' emotive language and achieve **impartiality** is an important and dif-ficult skill. It entails stripping away emotional bias, as far as possible, and seeking to express things from a neutral perspective. To do this we must:

- Recognize the bias contained in highly emotive language.
- Clearly and accurately express the relevant facts.
- Remain aware of relevant differing beliefs about the significance of these facts.
- Offer some evaluation as to the reasonableness of different beliefs.

Rhetorical devices are persuasive techniques used to enhance the appeal of a message:

- **Rhetorical questions** are not intended literally and do not require an answer, but have an assumed answer that is used for emphasis.
- **Jargon** consists of words and phrases likely only to be familiar to experts, sometimes used to confuse or exclude non-experts.
  - **Buzzwords** are fashionable words or phrases used to make something sound impressive, often with little meaning beneath their surface.
- **Smokescreens** are a kind of verbal concealment, using the discussion of irrelevant points to hide the fact that someone is avoiding a difficult subject.

- **Euphemism** entails deliberately replacing a phrase with negative connotations, by substituting something neutral or even positive-sounding in its place.

- **Hyperbole** deliberately exaggerates something for rhetorical effect.

- **Litotes** deliberately understates or uses a negative to make a point sound more convincing or likely to be accepted.

- **Paralepsis** introduces an idea while claiming it's not your intention to discuss it, allowing you to make suggestions without taking any responsibility for them.

9. HOW CAN YOU THINK CRITICALLY ABOUT FALLACIES AND FAULTY REASONING

A **fallacy** is a recognisable general type of faulty reasoning. Effectively engaging with a fallacious argument means identifying its **unwarranted hidden assumption**. If necessary, a **comparable example** can help both to clarify whether an argument is fallacious and to illustrate persuasively why it is flawed.

Fallacious arguments cannot guarantee the truth of their conclusions, but they are not the same thing as arguments with false premises:

- An argument is not necessarily fallacious when it is based on a false premise or when it has a false conclusion.
  - A fallacious argument can still have true premises.
  - A fallacious argument can still have a true conclusion.

There are two broad categories of fallacies:

- **Informal fallacies** are faulty or flawed forms of reasoning that relate to the content of premises, and must be determined with reference to external information.
- **Formal fallacies** are logically invalid forms of argument, and the fault in their reasoning can be determined purely by reference to logical structure.

Three general types of informal fallacy are:

- **Fallacies of relevance (red herrings)**: these rely on premises that are either irrelevant or not suf-ficiently relevant to reasonably support a conclusion.
- **Fallacies of ambiguity (linguistic fallacies)**: these occur when the meanings of words or con-cepts are twisted during the course of reasoning, or uncertainty and ambiguity are used to support an unjustified conclusion.

- **Material fallacies (fallacies of presumption)**: these have premises that assume too much and that represent some of the most common techniques of poor reasoning, even when they are not necessarily fallacious.

Four common formal fallacies are:

- **Affirming the consequent**: this is based on the mistaken assumption that, if B will necessarily be true when A is true, then observing B is sufficient to prove that A is also the case: 'If you love me, you'll reply to my email. You replied to my email, so you must love me.' It has the general form: 'If A, then B. B. Therefore, A.'

- **Denying the antecedent**: this is based on the mistaken assumption that, if B will necessarily be true when A is true, then observing that A is not the case must also mean that B is not the case: 'If you order steak, you'll enjoy your meal. You didn't order steak. So you cannot enjoy your meal.' It has the general form: 'If A, then B. Not A. Therefore, not B.'
- **The undistributed middle**: this is based on the unwarranted assumption that knowing X about members of a category is the same as knowing that X applies only to members of that cat-egory. For example: 'All magicians have beards. My friend has a beard. So he must be a magician!' Even if it is true that 'all magicians have beards', this is not at all the same thing as saying that 'only magicians have beards'. In general, the fallacy takes the form: 'All As are B. C is B. Thus, C is also A.'
- **Base rate neglect**: this is based on the logical-seeming claim that, if most As are C and few Bs are C, then any randomly picked C is more likely to be an A than a B. Why is this fallacious? Because until we know how big category A is, relative to category B, we cannot in fact say anything about how likely a randomly picked case is to belong to either group. For example: 'Most diplomats are bilingual. Few ordinary Londoners are bilingual. If I meet someone bilingual in London, they're likely to be a diplomat.' This is a fallacious argument, because it neglects the fact that there are very few diplomats in London relative to the overall population.

10. HOW CAN YOU THINK CRITICALLY ABOUT COGNITIVE AND BEHAVIOURAL BIAS

Careful, conscious scrutiny is a time-consuming and resource-intensive process, and so humans have evolved to rely on a large number of largely unconscious, instinctual and emotive approaches to making rapid yet broadly accurate judgements.

We call the cognitive short cuts that allow quick decision-making and judgement **heuristics**. They usually involve replacing a complex question with something amenable to a quick, simple solution.

Four types of heuristic are of particular interest and feature prominently in the literature of **Behavioural Economics** – a young field that uses the methods and insights of psychology to investi-gate real-life decision-making behaviours, based on experimental observation:

- The **affect heuristic** describes a tendency to use the strength of positive or negative emotional reactions as a decision-making short cut.
- The **availability heuristic** describes a tendency to be disproportionately influenced by whatever most easily or vividly comes to mind when making a decision or assessing options.

•• The **anchoring effect** describes our reliance on an initial value or frame of reference in reaching a judgement, even when it is of no relevance to the question we are being asked to judge.

•• The **representativeness heuristic** describes a tendency to be influenced by the plausibility of a story or characterization, at the expense of assessing its likelihood.

Becoming more aware of the heuristics that everyday thinking relies on can help us base our investigations of human experience on a realistic assessment of how judgements are reached. This awareness can also help us be alert to – and put strategies in place to resist – both deliberate manipulations and accidental sources of error.

Most of the time, heuristics are effective and reliable in everyday situations, especially when they involve dealing with people we know and situations of which we have plenty of experience.

When they result in an incorrect judgement, however, this is an example of **cognitive bias** – a predictable distortion of judgement or thought. Significant cognitive biases include:

•• **Framing effects**: presenting the same scenario in different ways can affect judgement and alter preference, based on perceptions of loss and gain, positive and negative.
•• **Re-framing**: deliberately selecting a different way of presenting information in order to challenge the emphasis created by a particular initial framing.
•• **Loss aversion**: the observation that losses are more painful than equivalent gains are perceived as beneficial, and that people thus tend to be biased towards loss avoidance.
•• **Confirmation bias**: the tendency to pay attention only to things that confirm our pre-existing ideas, and to ignore or seek to explain away evidence that contradicts them.
•• **Sharpshooter fallacy/clustering illusion**: the tendency to see a pattern where none exists, by imposing it after the event on evidence while ignoring whatever doesn't fit.
•• **Just world hypothesis**: the belief that everything balances out in the end and that the world is fundamentally arranged in a way that is fair.
• **Coherence effect**: the tendency to judge information not by its accuracy or likelihood, but by how internally coherent a story or worldview it embodies.

• **Dunning-Kruger effect**: the tendency of people with little ability in an area to greatly over-estimate their skill, meaning ignorance breeds unwarranted confidence.

• **Overconfidence effect**: the tendency of most people – and especially experts outside their domain of expertise – to have excessive faith in their judgements and abilities.

How can you best overcome bias in yourself and others
What do you need to know in order to **distrust your intuitions effectively**? Watch out for three types of misclassification:

•• We wrongly assume that something that **happened by chance** is significant.

•• We overlook the significance of **those things that did not happen**.

•• We assume that things are **more regular and predictable** than they actually are.

First, attaching excessive significance to random events:

•• The **law of small numbers** suggests that, the smaller a sample or the fewer times something is measured, the more likely its results are to differ from the expected outcome. By contrast, the **law of large numbers** suggests that, the larger a sample or the more often a consistent measure is repeated, the more likely its results are to tend towards the expected outcome.

•• **Reversion to the mean** describes the fact that an exceptional result is most likely to be fol-lowed by a less exceptional result, and an outstanding performance by a less outstanding performance.

•• The **fundamental attribution error** is a tendency to disproportionately view events as the result of deliberate actions and intentions, rather than as a product of circumstances.

•• **Moral luck** describes the paradox that we ought only to blame people for things they control, and yet in practice we often judge them by the result of fortunate or unfortunate events that lie beyond their control.

Second, failing to consider things that didn't happen:

•• **Outcome bias** describes a tendency to assess the quality of a decision by looking only at its result, rather than by considering whether it made sense at the time.
•• **Survivorship bias** describes a tendency only to pay attention to survivors and success stories, creating a distorted picture that ignores failures.
•• In order to avoid falling into the traps above, we need to consider **alternative histories**: the range of different possibilities that exist at a particular moment in time, together with their likelihood. Over time, alternative histories will 'catch up' with those following an unwise decision-making strategy.

•• **Hindsight bias** is a tendency to see the past, in retrospect, as more predictable than it actually was, and to treat unforeseen events as though they were foreseeable
• In academia, **publication bias** describes the temptation for journals to publish research with positive or striking outcomes in preference to other, equally valid research that demonstrates a lack of significance or causation.

• **Cherry-picking** in research means deliberately selecting a few striking results or strong effects from within a larger piece of research while suppressing the rest, thus misrepresenting the strength of the effects under investigation.

Third, over-estimating regularity and predictability:

• We need to be alert to the **impact of extremes**: the fact that just one extreme event, even if rare, can have a more significant impact than any number of ordinary events.

• We need to beware the **illusion of predictability**: the belief that an observed pattern will necessarily be repeated, or that current notions of normality will always apply.

Finally, we need to be aware of where our abilities and vulnerabilities lie:

• We are very well adapted, in general, to **assessing small-scale social situations** rapidly and accurately, so long as we know the conventions governing them.

• We are relatively poorly adapted, in general, to **assessing large-scale, complex problems involving statistics**, and are often misled by intuition when facing them.

11. HOW CAN YOU BE A MORE CRITICALLY ENGAGED USER OF TECHNOLOGY

In a digital age, there is a tension between what it means to acquire, debate and disseminate knowl-edge and to interact constantly with and through information systems.

•• **Acquiring, debating and disseminating knowledge** tends: to be slow and effortful, to prioritize truth and accuracy, to persuade primarily through reasoning, and to actively invite debate and dissent.

•• **Interacting constantly through shared information systems** can put an emphasis on speed and ease, on emotional and social impact, on popularity rather than truth, and on confirmation- and consensus.

Given that elements of both of these tendencies are present in most uses of technology, an impor-tant underlying question is:

•• How effectively are we able to pursue knowledge while also interacting through shared, sociable information systems, and benefiting from their opportunities?

To think precisely about this process, it is useful to make a distinction between data, information and knowledge:

•• **Raw data** is figures or facts, awaiting organization.

•• **Information** is data that has been structured, processed, arranged or placed in a particular context in order to make it meaningful.
•• **Verification** entails performing a reliable process in order to investigate the accuracy and rel- iability of information.
•• **Knowledge** is information that has been verified, and that we thus have good reason to believe describes the way things actually are.
•• **Transparency** entails honesty and clearly showing your process of verification and acknow- ledging its limitations.
•• **Authority** describes the claim, based on its source, that one particular account of the way things are has primacy over others.

More information does not automatically create more knowledge. In fact, it creates considerable challenges when it comes to creating knowledge and understanding. Particular vulnerabilities and biases to be alert to in information environments include:

•• The power of **social proof** and its conflation of **authority** with **popularity**.

•• An emphasis on **impact over insight**, and on **quantity over quality**.

•• The prevalence of **echo chambers**, **network effects**, **filter bubbles** and **polarization**, together with the **tyranny of the minority**.
•• **Recency bias**, together with an emphasis on **speed** and **freshness** as proxies for significance and merit.

All of these challenges are connected to time and attention, and to our reliance on cognitive heuristics- (mental short cuts) when called on to make decisions constantly and rapidly within an environment where we are continually exposed to others' opinions.

When conducting any investigation, we need to account for four different general types of know- ledge and ignorance, and to do so by deploying both an effective **search strategy** (finding something specific that we know we are looking for) and a **discovery strategy** (discovering what it is we ought to be looking for):

- **Identified knowledge** ('known knowns'): those things we know that we know and that are typi-cally just one click or careful search term away online.

- **Identified ignorance** ('known unknowns'): those things we know that we do not know, and are thus explicitly setting out to investigate or discover.

- **Unidentified knowledge** ('unknown knowns'): those things that are known but have not been identified as a source of knowledge by us.

- **Unidentified ignorance** ('unknown unknowns'): those things we now know we do not know and will thus find out about belatedly, if at all.

Gaining knowledge within this last category of 'unknown unknowns' is difficult and demands the deliberate cultivation of a **diversity of sources**, an **open planning period**, continued exposure to **serendipitous information**, and remaining **open-minded, flexible** and resistant to **prevailing opinion**.

12. HOW CAN YOU BECOME A CRITICALLY ENGAGED WRITER AND THINKER

Good writing begins with good reading: reading widely, passionately and actively. Write notes, plan

your strategy and start filling the page and the screen sooner rather than later. All good writing is also **rewriting**. Learn to read your own work closely, with a critical eye. When writing in an academic context, follow these steps:

- Ensure you understand what is being asked of you.

- Plan your reading, conduct your research and gather information.

- Structure your content and draw up an outline.

- Come up with a good introduction.
- Write the main body of your work in a logical sequence.
- Write a conclusion that clearly answers the question you began with.
- Finish your first draft and set aside the time to revise it.
- Don’t forget to provide references and a bibliography.
- Embrace feedback and conversations. Learn and improve.

When it comes to getting the work done, ask yourself:

- What **holds me back** psychologically from writing and engaging?
- What are the most **significant practical obstacles** to working in the way I would like to work, and achieving what I would like to achieve?
- What is my **strategy** for overcoming these obstacles?